monitoring, and measuring. The appendices are informational and advisory and do not create mandatory requirements.

(b) Appendix E of this subpart contains tests and procedures for fitting respirators. As required by §197.550(d)(1), compliance with appendix E of this subpart is mandatory.

APPENDIX A TO SUBPART C TO PART 197—SAMPLE SUBSTANCE SAFETY DATA SHEET, BENZENE

I. Substance Identification

(a) *Substance:* Benzene.

(b) *Performance standard exposure limits:*

(1) Airborne: The maximum time-weighted average (TWA) exposure limit is one part of benzene vapor per million parts of air (one ppm) for an eight-hour workday and the maximum short-term exposure limit (STEL) is five ppm for any 15-minute period.

(2) Dermal: Eye contact must be prevented and skin contact with liquid benzene must be limited.

(c) *Appearance and odor:* Benzene is a clear, colorless liquid with a pleasant, sweet odor. The odor of benzene does not provide adequate warning of its hazard.

II. Health Hazard Data

(a) *Ways in which benzene affects your health.* Benzene can affect your health if you inhale it or if it comes in contact with your skin or eyes. Benzene is also harmful if you swallow it.

(b) *Effects of overexposure.* (1) Short-term (acute) overexposure: If you are overexposed to high concentrations of benzene, well above the levels where its odor is first recognizable, you may feel breathless, irritable, euphoric, or giddy and you may experience irritation in your eyes, nose, and respiratory tract. You may develop a headache, feel dizzy, nauseated, or intoxicated. Severe exposures may lead to convulsions and loss of consciousness.

(2) Long-term (chronic) exposure: Repeated or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders ranging from anemia to leukemia, an irreversible, fatal disease. Many blood disorders associated with benzene exposure may occur without symptoms.

III. Protective Clothing and Equipment

(a) *Respirators.* Respirators are required for those operations in which engineering controls or work practice controls are not feasible for reducing exposure to the permissible level or are not chosen as the method of complying with the performance standard. If respirators are worn, they must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval. Cartridges or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. If you experience difficulty breathing while wearing a respirator, you may request a positive pressure respirator from your employer. You must be thoroughly trained to use the assigned respirator, and the training will be provided by your employer.

(b) *Protective clothing.* You must wear appropriate protective clothing (such as boots, gloves, sleeves, and aprons) over any parts of your body that could be exposed to liquid benzene.

(c) *Eye and face protection.* You must wear splash-proof safety goggles if it is possible that benzene may get into your eyes. In addition, you must wear a face shield if your face could be splashed with benzene liquid.

IV. Emergency and First Aid Procedures

(a) *Eye and face exposure.* If benzene is splashed in your eyes, wash it out immediately with large amounts of water. If irritation persists or vision appears to be affected, see a doctor as soon as possible.

(b) *Skin exposure.* If benzene is spilled on your clothing or skin, remove the contaminated clothing and wash the exposed skin with large amounts of water and soap immediately. Wash contaminated clothing before you wear it again.

(c) *Breathing.* If you or any other person breathes in large amounts of benzene, get the exposed person to fresh air at once. Apply artificial respiration if breathing has stopped. Call for medical assistance or a doctor as soon as possible. Never enter any vessel or confined space where the benzene concentration might be high without proper safety equipment and with at least one other person present who will stay outside. A life line should be used.

(d) *Swallowing.* If benzene has been swallowed and the subject is conscious, do not induce vomiting. Call for medical assistance or a doctor immediately.

V. Medical Requirements

If you will be exposed to benzene at a concentration at or above 0.5 ppm as an eight-hour time-weighted average or have been exposed at or above 10 ppm in the past while employed by your current employer, your employer may be required by 46 CFR 197.560 to provide a medical examination and history and laboratory tests. These tests must be provided without cost to you. In addition, if you are accidentally exposed to benzene (either by ingestion, inhalation, or skin/eye contact) under emergency conditions known or suspected to constitute a toxic exposure to benzene, your employer is required to

make special laboratory tests available to you.

VI. Observation of Monitoring

The employer is required to conduct monitoring that is representative of your exposure to benzene, and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must wear the protective clothing and equipment (See 46 CFR 197.575.)

VII. Access to Records

You or your representative may see the records of monitoring of your exposure to benzene upon written request to your employer. Your medical examination records may be furnished to you, your physician, or a representative designated by you. (See 46 CFR 197.570(c).)

VIII. Precautions for Safe Use, Handling, and Storage

Benzene liquid is highly flammable. Benzene vapor may form explosive mixtures in air. All sources of ignition must be controlled. Use non-sparking tools when opening or closing benzene containers. Fire extinguishers, where required, must be readily available. Know where they are located and how to operate them. Smoking is prohibited in areas where benzene is used or stored.

APPENDIX B TO SUBPART C TO PART 197—SUBSTANCE TECHNICAL GUIDELINES, BENZENE

I. Physical and Chemical Data

(a) *Substance identification.* (1) Synonyms: Benzol, benzole, coal naphtha, cyclohexatriene, phene, phenyl hydride, pyrobenzol. (Benzin, petroleum benzin, and benzine do not contain benzene).

(2) Formula: $C_6 H_6$ (CAS Registry Number: 71–43–2).

(b) *Physical data.* (1) Boiling point (760 mm Hg): 80.1 °C (176 °F).

(2) Specific gravity (water = 1): 0.879.

(3) Vapor density (air = 1): 2.7.

(4) Melting point: 5.5 °C (42 °F).

(5) Vapor pressure at 20 °C (68 °F): 75 mm Hg.

(6) Solubility in water: .06%.

(7) Evaporation rate (ether = 1): 2.8.

(8) Appearance and odor: Clear, colorless liquid with a distinctive sweet odor.

II. Fire, Explosion, and Reactivity Hazard Data

(a) *Fire.* (1) Flash point (closed cup): −11 °C (12 °F).

(2) Autoignition temperature: 580 °C (1076 °F).

(3) Flammable limits in air, % by volume: Lower: 1.3%, Upper: 7.5%.

(4) Extinguishing media: Carbon dioxide, dry chemical, or foam.

(5) Special fire fighting procedures: Do not use a solid stream of water, because it will scatter and spread the fire. Fine water spray may be used to keep fire-exposed containers cool.

(6) Unusual fire and explosion hazards: Benzene is a flammable liquid. Its vapors can form explosive mixtures. All ignition sources must be controlled when benzene is used, handled, or stored. Areas where liquid or vapor may be released are considered hazardous locations. Benzene vapors are heavier than air. Thus, benzene vapors may travel along the deck and ground and be ignited by open flames or sparks at locations remote from the site at which benzene is handled.

(7) Benzene is classified as a flammable liquid for the purpose of conforming to the requirements of 49 CFR 172.101 concerning the designation of materials as hazardous materials. Locations where benzene may be present in quantities sufficient to produce explosive or ignitable mixtures are considered Class I Group D locations for the purposes of conforming to the requirements of 46 CFR parts 30 through 40, 151, and 153 when determining the requirements for electrical equipment as specified in Subchapter J (Electrical engineering).

(b) *Reactivity.* (1) Conditions contributing to instability: Heat.

(2) Incompatibility: Heat and oxidizing materials.

(3) Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide).

III. Spill and Leak Procedures

(a) *Steps to be taken if the material is released or spilled.* As much benzene as possible should be absorbed with suitable materials, such as dry sand or earth. That remaining must be flushed with large amounts of water. Do not flush benzene into a confined space, such as a sewer, because of explosion danger. Remove all ignition sources. Ventilate enclosed places.

(b) *Waste disposal method.* Disposal methods must conform to state and local regulations. If allowed, benzene may be disposed of (a) by absorbing it in dry sand or earth and disposing in a sanitary landfill, (b), if in small quantities, by removing it to a safe location away from buildings or other combustible sources or by pouring onto dry sand or earth and cautiously igniting it, and (c), if in large